Reconstruction of Defects Involving the Nasal Ala and the Nasolabial Fold: The Role of the Microvascular Prehelical Rim Graft

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Reconstruction of defects involving the nasal ala and the nasolabial fold – the role of the microvascular prehelical rim graft

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Short title

Prehelical rim graft for nasal ala and nasolabial fold reconstruction

Abstract

Purpose of the study: To demonstrate a surgical technique for reconstructing defects involving the triangle of the nasal ala, nasolabial fold and upper lip.

Procedures: Retrospective survey with follow-up including 4 consecutive patients with extensive skin and soft tissue defects

Results: Successful reconstruction with good nasal function and acceptable cosmetic result was achieved in all patients

Conclusions: The microvascular helical rim graft offers an unique option to reconstruct defects in this specific triangular area of the face when standard techniques have failed.

Keywords

nose; nasal ala; reconstruction; microvascular surgery; transplant

Introduction

Successful reconstruction of the aesthetic subunit of the nasal ala and the nasolabial fold is challenging, as several goals have to be fulfilled. From a functional point of view, nasal obstruction that is often caused by scarring, can significantly impair the patient's quality of life. It is therefore imperative that an adequate and stable nasal aperture is created with the reconstruction. Furthermore defects in this highly conspicuous anatomical region pose a significant cosmetic burden. Consequently, reconstructive techniques must aim to reproduce the complex anatomic forms as closely as possible. There are many ways to reconstruct the nasal ala and the same is true for defects comprising the nasolabial fold. However, less is known about the reconstruction of tissue defects involving both the nasal ala and the adjacent nasolabial fold.

The nasal ala should be reconstructed in three layers to prevent alar collapse due to missing cartilage or vestibular stenosis caused by scar contraction during healing by secondary intention in the absence of inner lining reconstruction. Conventional reconstructive techniques using composite grafts rely on excellent vascularization in the host tissue bed for long-term survival. However complex nasal defects usually arise in the context of previous surgery and/or radiation therapy causing the perfusion of surrounding tissue to be compromised. Introducing a graft with its own intrinsic blood supply would therefore be ideal to overcome this obstacle. This poses a particular challenge for reconstruction.

The literature holds few reports of microvascular procedures using free composite grafts from the ear to reconstruct the nasal ala and the nasolabial fold [1]. We aimed to describe this reconstructive technique for cases where standard reconstructive methods either failed or were deemed not to be an option.

Patients and Methods

The data of patients treated between 2010 and 2013 with defects of the nasal ala and the adjacent nasolabial fold after malignant skin tumor resection were collected retrospectively. All patients had an unfavorable cosmetic and/or insufficient functional result after primary reconstructive surgery. All except of one patient (*Case #1)*, who died from intercurrent disease, continue to be under oncologic follow-up for their skin cancer.

Case #1

The surgical technique is explained on a patient after ablation of the right side of the nose due to a squamous cell carcinoma (Fig 1 A) with heavy actinic skin damage and severe renal failure. The patient had received a reconstruction with a paramedian forehead flap and a composite graft. The subsequent radiotherapy caused the flap to retract significantly leading to a tissue defect at the alar base and a significant cosmetic disturbance (Fig 1 B).

Surgical technique:

a) Harvesting the graft

   To measure the dimension of the alar/nasolabial defect, a template based on the contralateral, intact side is used. The graft is outlined accordingly on the crus of the helix of the contralateral ear, fitting the size and dimension of the defect area (Fig 1 C). A branch from the superficial temporal artery and a concomitant draining vein are identified in the pretragal area using standard incision as for lateral parotidectomy approach (Fig 1 D). These vessels have to be followed proximally into the parotid gland to achieve a vascular pedicle with maximal length (Fig 1 E). After complete dissection of the vessels, the flap is incised as outlined.

   The defect on the donor site is closed by rotating the remaining auricle anteriorly. To

optimize the contour a wedge of cartilage based at the pivot point within the concha must be resected. Attention has to be paid not to provoke stenosis of the external auditory canal.

b) Fixing the graft at the defect

Before fixing the graft, all three layers (thus the inner lining, the cartilage and the skin) have to be identified at the recipient site. The inner lining is adapted with fast resorbable sutures, while cartilage and the skin are sutured separately. At the lateral end the cartilage is fixed at the periostium of the piriform aperture (Fig 2 A).

c) Vascular anastomosis

Depending on the available arterial supply the superior labial or a nasolabial facial artery and a concomitant vein (Fig 2 B) is used for anastomosis. Alternatively, a submandibular incision is performed to expose the facial vessels. A blunt subcutaneous tunnel is performed to pull through the vascular pedicle of the graft. Anastomosis of the artery and vein are performed using standard microsurgical techniques.

Case #2

This 65 year old male was referred with a diffusely infiltrating basal cell carcinoma at the nasolabial fold infiltrating the lateral portion of the right nasal ala. After micrographically controlled tumor resection (Fig 3 A and B) the cheek portion of the defect was initially reconstructed with a transposition flap, whereas the nasal ala was reconstructed with a composite graft from the right ear and a paramedian forehead flap (Fig 3 C). Due to intolerance of side effects the patient discontinued the prescribed oral antibiotic prophylaxis and after 7 days a severe wound infection manifested requiring systemic antibiotic treatment. A significant retraction of all flaps led to an unsatisfactory cosmetic outcome, foremost an upwards tethering of the upper lip due to scar contracture. The patient reported no functional

problems (Fig 3 D). Revision surgery aimed to bring the upper lip down and to reconstruct the defect in the alar rim and nasolabial fold. A microvascular prehelical rim graft was considered to be the ideal solution (Fig 3 E and F).

Case #3

In this 51 year old female patient, a large, invasive basal cell carcinoma had destroyed several aesthetic subunits of the nose and cheek (Fig 4 A). After micrographically controlled resection an extensive reconstruction of the defect was required (Fig 4 B). The reconstruction plan included the reconstruction of the cheek defect with a cheek advancement flap while the nasal tip, the dorsum and the right ala were reconstructed with a paramedian forehead flap and a composite graft from the right ear. In addition a random pattern skin graft from the left nasolabial fold was used to cover the columellar skin defect (Fig 4C). The posterior half of the reconstructed right ala gradually turned superiorly so that a significant alar base asymmetry developed. A microvascular composite graft from the left crus of helix was therefore chosen to improve symmetry in the alar base. Superior labial vessels were used for the microvascular anastomosis (Fig 4 D and E). Some minor corrections of the contour are scheduled in near future.

Case #4

A basal cell carcinoma in the right nasolabial fold was excised with tumor free margins in this 65 year old male. The defect size had been significantly underestimated, why the wound was left to by secondary intention. As a consequence the patient developed an asymmetry in the superior lip, a deviation of the nasal tip to the right and puckering of the right ala. In addition, the patient complained of nasal obstruction on the right side caused by stenosis of the right nasal vestibulum (Fig 5 A and B). The patient refused reconstructive options extending to the other side of the face, thus precluding the use of local or pedicled flaps such as a paramedian

forehead flap. The scar contractures at the nasolabial fold and in the lateral aspect of the right ala were therefore released and similar to Case# 1 a microvascular preauricular and helical rim graft was harvested with a sufficient amount of skin to reconstruct the nasolabial defect. The graft vessels were anastomosed to the nasolabial artery and vein (Fig 5 C and D).

Discussion

There are many different ways to reconstruct skin or multilayer defects of the nasal ala. Similarly, there are several reconstructive options in the nasolabial fold, depending on the size and location of the defect [2]. To our knowledge, there are few descriptions of how to achieve good functional and aesthetic results after skin tumor resection involving both units. In our experience defects involving the ala as well as the nasolabial fold frequently lead to asymmetric results at the alar base area as the alar base tend to retract superiorly by subcutaneous scarring.

The technique of microvasular tissue transfer from the pinna has been described by Parkhouse and Evans in 1985 [3]. In 2004 Michlitz et al. [4] and later Dabernig et al. [5] used the crus of the helix for reconstruction of the ala and tip. In 2008, the latter could show that the crus has an ideal form for the nasal ala. Hence, this reconstructive technique is in itself not new. There are however some technical refinements, including the fact that the vascularized helical rim flap allows almost any size of adjacent skin from the preauricular region to be mobilized. This can be used either to reconstruct defects in the upper lip (case #2) or nasolabial fold (case #4). To bring vascularized tissue in this area of defect provides excellent and long-lasting option to enlarge the nasal vestibulum to prevent nasal obstruction. This circumvents the drawbacks of full thickness cartilage and skin grafts, whereas the latter tend to shrink over time.

A critical point is a meticulous technique in harvesting the vascular pedicle on the donor side. Although it may seem short, a pedicle length of 6-8 cm can be reached, when it is dissected into the cranial portion of the parotid gland, thus allowing an anastomosis to the labial artery or even the facial artery. For accurate positioning of the flap and convenient microvascular anastomosing to the labial vessels the flaps should be harvested from the contralateral side.

Before free flaps became available the surgeons already struggled with the tiny and long vessels in axial pattern grafts harvested from the preauricular area [6]. In addition, finding vessels with adequate calibers are essential. Han et al. [7] argued that a microvascularized composite graft from the retroauricular space is a valuable option. However, whether those vessels are of more adequate caliber is unclear. Most importantly the form of the composite graft in the conchal area of the pinna is rather straight than curved in our experience. The technique shown in our series is similar to Li et al. [8]. However they harvested the crus of helix and followed the vessels superior to the composite graft in contrast to our technique by which we used the more proximal arterial branches.

Patients rarely complaint about a cosmetic disfigurement due to defects on the donor site. Most of them could elegantly cover the helical crus defect by a longer haircut. Those requiring larger cartilage components of the graft necessarily will encounter significantly more disfigurement. However, the preoperative deficit in the nasolabial area must have had a greater subjective impact than the defect on the donor site, which is more likely to be accepted by the patient.

Conclusion

The main advantage of the microvascular helical rim graft consists in the ability to reconstruct not only the nasal ala but also the nasolabial fold in one surgical step. In addition minor corrections in the upper lip can be performed. Although harvesting the flap requires experienced microsurgical technique and possibly an interdisciplinary approach involving both plastic and ENT surgeons, we feel that the functional and aesthetic features of this reconstruction outweigh possible technical difficulties in cases in which time tested techniques such as a combination of a forehead flap or a nasolabial island flap with a septal mucoperichondrial inner lining and cartilage grafts are not an option.

Conflict of interest

The authors declare that they have no conflict of interest.

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Figure legends

Fig 1 A: Squamous-cell carcinoma involving the right nasal side

Fig 1 B: Severe deficit after radiotherapy with significant retraction of the paramedian forehead flap

Fig 1 C: Incision lines for harvesting the left crus of helix

Fig 1 D: Graft harvesting with vascular pedicle

Fig 1 E: Graft transfer and incision to identify recipient vessels

Fig 2 A: Fixation of the graft to achieve best possible symmetry

Fig 2 B: Microvascular anastomoses in the nasolabial fold

Fig 2 C and D: Result 3 months postoperative

Fig 3 A and B: Basal cell carcinoma in the nasolabial fold before and after resection

Fig 3 C: Defect reconstruction with cheek rotation flap, paramedian forehead flap with composite graft.

Fig 3 D: wound infection with significant flap retraction

Fig 3 E and F: Five months after preauricular and helical rim flap

Fig 4 A and B: Fifty-one year old female with extended basal cell carcinoma before and after resection (note: patient underwent preoperative biopsies on the nasal dorsum)

Fig 4 C: Defect reconstruction with cheek advancement and paramedian forehad flap as well as a random pattern flap to reconstruct skin defect on the columella. Note the defect in the latero-dorsal aspect of the right ala

Fig 4 D and E: Six months after microvascular reconstruction

Fig 5 A and B: Retraction of right upper lip and nasolabial fold after resection of a basal cell carcinoma with secondary wound healing

Fig 5 C and D: Four months after reconstruction.

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